

lane in each direction of a single track with low train volumes and speeds in a moderate density suburban area.

During the evaluation, we examined the mechanical reliability of the system and also measured:

- Sound level,
- Motorist behavior,
- Motorist opinion,
- Area resident opinion, and
- Train engineer opinion.

Sound measurements were from a large set of data recorded from hand-held meters. Sounds from the wayside horn were measured on the same day as sounds from a working locomotive. Motorist behavior was judged based on images from a camera system. Our main measure of effectiveness was the number of crossings of the stop bar after warning devices had been activated. We recorded and analyzed over 250 events when motorists had to react to a train event at the crossing. Motorist and resident opinion were based on postcard surveys mailed back to the research team and a few interviews. Sample sizes were around 50 responses in the before period and 25 in the after period for both surveys.

Based on the results from previous studies and the results from our test described above, the study team arrived at several conclusions regarding the use of a wayside horn at railroad grade crossings. First, the team concluded that the wayside horn offers significant sound relief to residents and others in the area around a crossing. This conclusion is based on our most robust data. Along the track and throughout the neighborhood the wayside horn reduced sound levels by 10 to 25 decibels compared to the locomotive horn. Along the road, the wayside horn produced about the same sound levels as the locomotive horn at a couple of points, but was generally 5 to 10 decibels quieter. Our resident survey picked up some indication that this lower sound level made some residents happier, particularly those near the crossing and track.

Second, the team concludes that the wayside horn has led to slight, if any, shifts in driver behavior and opinion. Driver opinion is difficult to judge based on our small, changing sample, but seemed to indicate overall that most drivers do not notice a change from locomotive to wayside horn. The driver behavior data we collected are more important and robust than the driver opinions. Those data showed only small shifts in the number of drivers crossing the stop bar after device activation, with some of the small changes better for the wayside horn and some better for the locomotive horn.

Finally, the study team concludes that the wayside horn appears to be reliable and acceptable to train engineers. It is likely that the early research experiences with less reliable wayside horns have been corrected. The fail-safe design of the wayside horn is also comforting in this regard.

Based on the study results and the conclusions provided above, the study team recommends that the FRA, the NCDOT and other state DOTs, local agencies, and railroads continue to allow the use of wayside horns when evaluated as part of an engineering diagnostic. The evidence from